

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

# (12) UK Patent Application (19) GB (11) 2 188 550 (13) A

(43) Application published 7 Oct 1987

(21) Application No 8606788

(22) Date of filing 19 Mar 1986

(71) Applicant  
John Alan Drew,  
433 Uxbridge Road, Ealing, London W5 3NT

(72) Inventor  
John Alan Drew

(74) Agent and/or Address for Service  
Marks & Clerk, 57-60 Lincoln's Inn Fields, London WC2A 3LS

(51) INT CL<sup>4</sup>  
A61F 5/04

(52) Domestic classification (Edition I)  
A5R 6 FB

(56) Documents cited  
GB A 2139089 US 4393866

(58) Field of search  
A5R  
Selected US specifications from IPC sub-class A61F

## (54) Ankle foot orthosis

(57) A calf band 2, which is to pass around the leg, has a central portion 4 connected to the upper end portion of a posterior leaf spring 1 and two lateral portions 3 which are to overlap in front of the leg and which are connected together by suitable means 13. The central portion 4 provides a cushion between the said upper end portion and the calf. A kit for making the orthosis comprises a number of posterior leaf springs of various sizes.

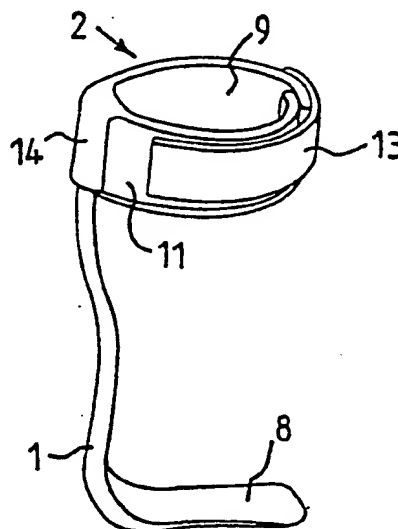


FIG. 1.

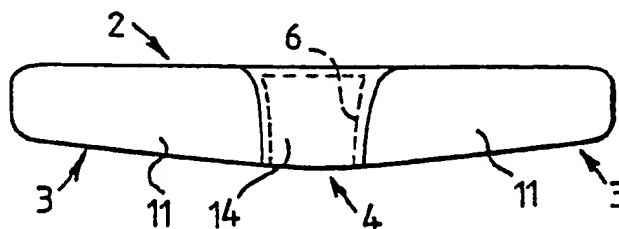


FIG. 4.

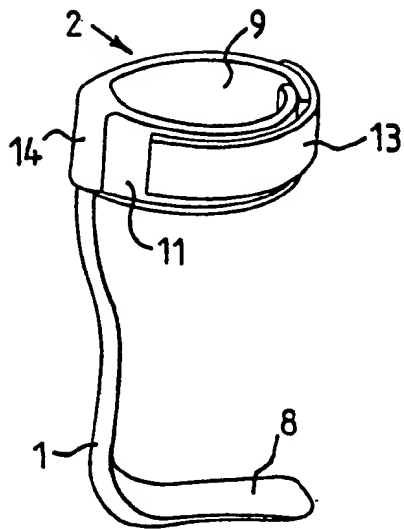


FIG. 1.

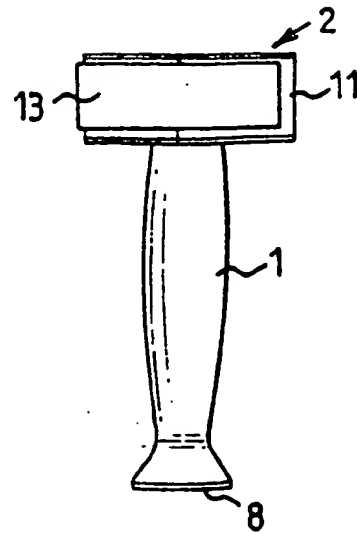


FIG. 2.

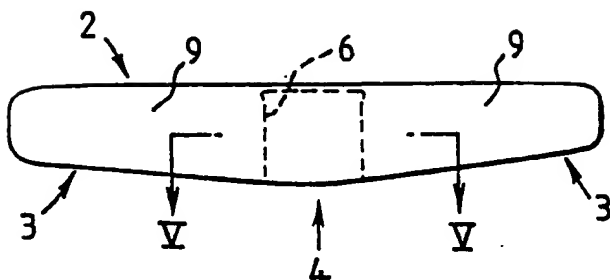


FIG. 3.

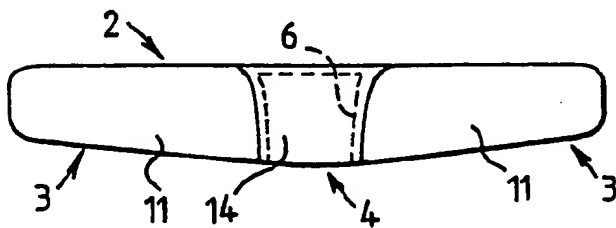


FIG. 4.



FIG. 6.

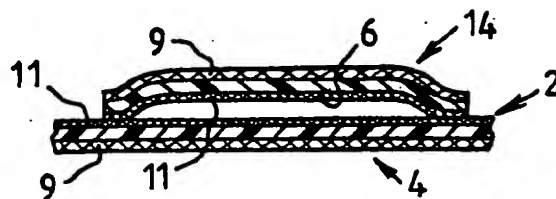


FIG. 5.

## SPECIFICATION

## Ankle foot orthosis

- 5 The invention relates to an ankle foot orthosis. Such an orthosis may assist dorsiflexion or prevent dropping of the foot.

In many situations, the efficacy of any prescribed orthosis may depend on two factors: the fit and the time taken to supply once the need has been identified.

The conventional method of making an orthosis has been to take a negative cast from which a positive model of the leg is prepared and to mould a high molecular weight plastics to this cast to create a bespoke orthosis. However, this is a long and expensive process. What is desired is an orthosis which is simple in construction and can be fitted without delay.

- 20 The present invention provides an ankle foot orthosis comprising: a posterior leaf spring, i.e. a resilient member which is to descend along the calf, pass round the heel, and project under the foot; a calf band which is to pass around the leg, the calf band having a central portion which is connected to the upper end portion of the posterior leaf spring and which provides a cushion between the said upper end portion and the calf and having two lateral portions which are to overlap in front of the leg; and means for connecting the overlapped lateral portions of the calf band together.

The posterior leaf spring is preferably of thermosoftening plastics or carbon fibre composite material, so that it can, if required, be adjusted in shape by moulding. It is preferably symmetrical with respect to a vertical plane, in order to fit right and left legs.

The calf band is preferably of expanded plastics material (e.g. "Plastazote" or "Frelen", both trade marks for expanded cross-linked polyethylenes) with a fabric covering. The outer surface of the lateral portions of the calf band is preferably constituted by a multiplicity of fine loops (e.g. of terry or brushed nylon); this provides the advantage that the means for connecting the overlapped lateral portions can simply be a strip provided on one side with a multiplicity of fine hooks, e.g. a strip of "Velcro" (trade mark) hook tape.

The central portion of the calf band preferably has a pocket which receives the upper end portion of the posterior leaf spring. The said upper end portion is preferably provided with a multiplicity of fine hooks which engage a multiplicity of fine loops on a corresponding surface or surfaces of the pocket. Alternatively an adhesive may be used.

The invention also provides a kit for making an orthosis as described above, comprising a plurality of posterior leaf springs as defined above, of various sizes, at least one calf band as defined above, each posterior leaf spring being connectable to the central portion of the or each calf band, and means for connecting the overlapped lateral portions of the or each calf band together.

The invention will be described further, by way of example, with reference to the accompanying

drawings, in which:

*Figure 1* is a perspective view of an ankle foot orthosis;

*Figure 2* is a front view of the orthosis;

70 *Figure 3* is a front view of a calf band;

*Figure 4* is a rear view of the calf band;

*Figure 5* is an enlarged fragmentary section on line V-V in *Figure 3*; and

*Figure 6* is a front view of a posterior leaf spring.

75 The orthosis illustrated comprises a posterior leaf spring 1 made of "Ortholene" (a trade mark for an ultra-high molecular weight polyethylene), which is mouldable at about 190°C, and a calf band 2 having two lateral portions 3 and a central portion 4 with a pocket 6 which receives the upper end portion 7 of the posterior leaf spring 1.

The posterior leaf spring 1 is symmetrical with respect to a vertical plane and its foot piece 8 is of such a length that it will come to just behind the metatarsal heads. Alternatively the foot piece could be sufficiently long to come in front of the metatarsal heads. The posterior leaf spring 1 is selected from a stock of various sizes (e.g. five). It can be modified in shape (by moulding and/or grinding) to suit particular abnormalities.

85 The calf band 2 is of "Frelen", with an internal covering 9 of terry and an external covering 11 of brushed nylon. In the central portion 4 the material of the calf band has a flap 14 which is folded over the outside and stitched to form the pocket 6, whose internal surfaces are therefore of brushed nylon. "Velcro" hook material 12 on at least the anterior surface of the upper portion 7 of the posterior leaf spring 1 engages with the multiplicity of fine loops constituted by the brushed nylon in the pocket 6 so as to connect the calf band firmly to the posterior leaf spring.

100 The lateral portions 3 of the calf band taper away from the central portion 4 and are overlapped left-over-right (as shown) or right-over-left, whichever suits the patient. The calf band 2 is made sufficiently long to fit a range of calf circumferences (e.g. from 30 to 45 cm). The overlapping portions 3 are connected by a removable length of "Velcro" hook tape 13, one end of which is turned in on itself to form a grippable tongue facilitating opening and closing of the calf band.

105 The calf band 2 serves as a cushion between the upper end of the posterior leaf spring 1 and the calf and it distributes over a large area the reaction forces of the posterior leaf spring, thereby reducing the pressure exerted on the soft tissue of the calf and the tibial crest, this being particularly important for patients with delicate skin or vascular problems. If required, the thermosoftening expanded plastics material ("Frelen") of the calf band 2 can be moulded to fit as closely as possible.

## CLAIMS

- 125 1. An ankle foot orthosis comprising: a posterior leaf spring (as defined hereinabove); a calf band which is to pass around the leg, the calf band having a central portion which is connected to the upper end portion of the posterior leaf spring and which

provides a cushion between the said upper end portion and the calf and having two lateral portions which are to overlap in front of the leg; and means for connecting the overlapped lateral portions of the calf band together.

2. An ankle foot orthosis as claimed in claim 1, in which the posterior leaf spring is of thermosoftening plastics or carbon fibre composite material.

3. An ankle foot orthosis as claimed in claim 1 or 2, in which the posterior leaf spring is symmetrical with respect to a vertical plane.

4. An ankle foot orthosis as claimed in any preceding claim, in which the calf band is of expanded plastics material with a fabric covering.

5. An ankle foot orthosis as claimed in any preceding claim, in which the outer surface of the lateral portions of the calf band is constituted by a multiplicity of fine loops.

6. An ankle foot orthosis as claimed in claim 5, in which the connecting means comprises a strip provided on one side with a multiplicity of fine hooks.

7. An ankle foot orthosis as claimed in any preceding claim, in which the central portion of the calf band has a pocket which receives the upper end portion of the posterior leaf spring.

8. An ankle foot orthosis as claimed in claim 7, in which the said upper end portion is provided with a multiplicity of fine hooks which engage a multiplicity of fine loops on a corresponding surface or surfaces of the pocket.

9. A kit for making an ankle foot orthosis according to claim 1, comprising a plurality of posterior leaf springs (as defined hereinabove) of various sizes, at least one calf band as defined in claim 1, each posterior leaf spring being connectable to the central portion of the or each calf band, and means for connecting the overlapped lateral portions of the or each calf band together.

10. An ankle foot orthosis substantially as described with reference to, and as shown in, the accompanying drawings.

11. A kit for making an ankle foot orthosis, substantially as described with reference to the accompanying drawings.